A

LETTER

TO

PROFESSOR STEWART,

ON THE

OBJECTS OF GENERAL TERMS,

AND ON THE

AXIOMATICAL LAWS OF VISION.

BY J. FEARN, ESQ.

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TO

DUGALD STEWART, ESQ.

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FORMERLY PROFESSOR OF MORAL PHILOSOPHY IN THE UNIVERSITY OF EDINBURGH.

SIR,

IN presenting a view of the two following subjects, each of which has occupied the attention and urged the genius of thinking men, to a great and celebrated extent, I am impelled by reasons of no ordinary complexion: And, while it is to be expected that the topic which stands *first* subjoined, may, in the outset, interest a more numerous class of literary persons, I am highly urged to solicit the important issue of your earnest notice of that one which is placed LAST. The former subject, however, (besides its own importance) has a certain bearing upon the latter, although it be not obvious here.

The matter of the "LAWS OF VISION," is presented as exhibiting what I (who certainly speak under strong inducements to caution) am obliged, by the nature of the thing, to consider *a mathematical analysis* of the *consti-*

tuents, or cause, of VISIBLE FIGURE. This, I apprehend, it must be considered; since the FOUR LAWS OF VISION *are not physical laws, merely,* but are FOUR AXIOMS, whose truth consequently is *necessary,* and whose EVIDENCE is *certainly mathematical.* Fully anticipating, as I do, the first impression of so extraordinary a matter, and sensible of the utility of some sort of passport, in my peculiar case; may I therefore be permitted to offer the following observations?

When, about two years since, I ventured to publish a few copies of the "*Principles of Primary Vision,*" (the *first* hint concerning which, appeared about *four* years back) I had indeed a confident hope that I should have to repeat the subject: but I did not expect so curious and valuable a support, as the discovery that I am completely borne out by the rigorous assumption of an illustrious Greek Geometer. Such, however, is an authority which, owing to a recent communication, I am enabled to cite, and therefore purpose to bring forward here; not, however, without the additional concurrence of living individuals; which, together, form a very different voucher from my own very questionable judgment, as to whether this matter is an offering worthy of attention.

Valuing, as I must do, the concurrent authority of PROCLUS, thus made known to me; I rest no undue confidence either upon his, or upon any other single voice. In the present case, indeed, the *imperative nature of the evidence* looks down upon single suffrage: but, since even

mathematical propositions must bow to *collective suffrage*, I derive no small resolve from being able to pledge myself, here, that among the acute and scientific individuals to whom the matter has been personally communicated, there has occurred but one dissent, *(limited to inessentials)* and that one has not survived discussion. The principal value, therefore, which I attach to the *concurrence of* PROCLUS, is, that I feel no reluctance in making an open use of it, for the advancement of the subject.

While I am naming that Geometer, it may be of material consequence to state, that although the fact assumed by him must attest the truth of the Laws of Vision, yet, *these Laws have no dependence whatever on that fact.* But, of this I must speak hereafter. May I however add, that Proclus has not handed down his proofs, but that the fact itself was fallen upon by me, I need not say, without any knowledge that another had gone before. Indeed, that this fact, known to *Proclus*, was completely LOST *to the moderns*, AS TO ANY UTILITY, is fully manifest from its not being noticed by any one of those who have engaged on the great problem, *to find the* NATURE *and* PLACE of *visible figure.*

Of authorities, ancient and modern, who have ASSERTED the *dominion of* SENSE *over the* ELEMENTARY *objects of* GEOMETRY, there is a numerous host; and these are of the highest estimation: only they have *all failed to prove* their position by *shewing the* PRECISE MANNER, HOW *the elements of visible figure are* either connected, or formed.

Proclus alone is *partly* an exception, in having noted *one included* or *subordinate* fact; which, however, never led him to the Four Axioms of Vision, nor to the place *of perceived figure.*

Such, Sir, is the prospect of this matter: while, either from the want of some such passport as the foregoing, or from my own culpable remissness in not caring to urge the matter through the ordinary channels, or from some other cause, I am obliged to believe it cannot have reached your eye, or undergone the sentence of your judgment. Unquestionably, I am bound, to the present and to the future race, to place this matter in the direct channel of your notice, since the command to do so has fallen thus imperatively upon me.

Beside the Axioms of Vision, themselves; let me now beg to suggest to notice, their very remarkable agreement with that astonishing *metaphysical tenet* of the Hindoos, which makes "*the whole of creation rather an energy than a* "*work, by which the infinite mind, who is present at all* "*times, and in all places, exhibits to his creatures a set of* "*perceptions, like a wonderful picture, or piece of music,* "*always varied, yet always uniform.*"

Upon the bare mention of this (I had almost said divine) Hindoo tenet, it appears to me unavoidable to remark that, if it can strictly be said that it "took its rise from a high theological speculation," it must have been *indeed* a high *one;* since the most luminous results of

modern physical research have but led, by a slow and groping progress, toward this solar light of HINDOO PHILOSOPHY.—Can any person without astonishment contemplate such a coincidence of results, meeting from so very distant sources, and flowing through such different channels?

The mind is rapt and lost in attempting to conjecture, at what time, under what circumstances, and by what guidance, the early generations of our species were enabled to perfect a philosophy of such a flight, that the living spectator, of the highest cast, must feel shrunk in his intellectual dimensions on the comparison,—a philosophy which teaches the moderns, at once to appreciate the genius of a BERKELEY, and to stop at the line where that genius overstept upon error,—which *denies the* INERTNESS *of matter, without admitting such a* CHIMERA *as the* NON-REALITY OF EXTENSION.—Such is the EXTERNAL WORLD *of Hindoo science:* And, (so far, therefore, as any *extrinsic coincidence* can corroborate the sentence of *internal reasoning*,) may I not set value upon the fact, that this EXTERNAL WORLD OF THE HINDOOS, *is to* COLOUR AND FIGURE *in* US, as we suppose EXTERNAL FIRE *to be, to the* FIRE *in an* IRON *which it heats?* I indeed suppose this simile is vague; but I nevertheless affirm, that the relation appears to be *as requisite*, and *as close*, in the former case as in *the latter*, after we have gone through the *analysis of the phenomena of vision*.

The seeming correlation of these two subjects is the

more satisfactory, since the rays of Hindoo Knowledge that have pervaded the immense and hideous regions of their course to us, are ample evidence, that its pristine laboratory shined with an effulgence not now imaginable; and prove, that a day of science has once passed over the earth, whose fellow is yet but dawning upon mankind.

In fine, Sir, It cannot be unwelcome, to mark the direct bearing of these united results, *upon all the conclusions of* ATHEISM!—What a transition, from sublime admiration, to pity and debasement, does the mind suffer on turning from the HINDOO EXTERNAL WORLD, to listen to the GREEK *squabbles concerning* DEAD MATTER!—What a relief, to ascend back in contemplation, to that point where the physical speculations of a BOSCOVICH meet the metaphysical tenet of the HINDOO!—Can it be indifferent to the *philosopher*,—Can it be indifferent to the CITIZEN, to inquire whether an *Analysis of* MENTAL *Phenomena* makes A THIRD COINCIDENT upon this high point?

Here it remains only, that I have the honor to subscribe myself,

SIR,

Your most obedient servant,

JOHN FEARN.

London, July 31*st*, 1817.

ON THE

OBJECTS OF GENERAL TERMS.

PRELIMINARY OBSERVATIONS.

INDEPENDENT of the importance attached to the skilful use of language as an instrument of thought, and which therefore renders the following subject an inquiry of deep interest to the man of science; there is no person that has any pretensions to letters, but must feel it to be a manifest inconsistency with such pretensions, if he at the same time remain under a profound mistake, in regard to the true import of the great multitude of words which form the bulk of a language.

As for the importance which is attached to this subject in a higher view, by philosophers, it is sufficiently marked by the laboured extent to which it has been entertained; and this with no lessened ardour by the latest authorities, unabated by continued schism and the most unpromising auspices.

The unsatisfactory state of the celebrated question concerning *what are the* OBJECTS *of our thought when we make use of* GENERAL WORDS, has induced Professor Stewart to resume this topic, in the second volume of his "Elements of the Philosophy of the Human Mind," recently given to the public: although, in that resumption he disclaims offering any new ground of argument, for the solution of the grand

difficulty; and refers the reader back, to his "*first volume*," for that statement upon which, from the beginning, he had added the weight of his sanction on the side of NOMINALISM. The professed object of his renewal of the topic, was to counteract the effects of the opposition set up by Dr. Reid; since whose writings there has not been discovered any new ground of argument for the cause of Nominalism: while it is at the same time acknowledged by Professor Stewart, that the strictures of Dr. Reid, upon the concession of Bishop Berkeley and in maintenance of the doctrine of *Universal Conceptions*, have produced "*a deeper impression than he had expected.*"

From this state of the case it is evident, that there is not at this moment extant any barrier of opinion, of a logical strength sufficient to furnish an assurance, that the doctrine of Nominalism, which now claims by the accident of suffrage, may not hereafter fall a victim to the bias of some new authority, and be again ousted from philosophy; as was once before its fate, after having been some time received and triumphant in the world.

The past occurrence, even without contemplating the future possibility of such fluctuation in doctrines, in regard to what is unquestionably *a proper object of logical research*, is certainly humiliating: and it is not to be dissembled, that it presents an abasing reflection to the intellectual pretensions of the species, that after an extent of controversy almost unprecedented for ardour and continuance, through a succession of ages which has embraced the rise and whole progress of modern science, down to the present advanced era, there still subsists among men of learning an unpromising yet *unimpassioned and real* schism of opinion; when the subject in dispute is no other but to discover *what is the object of reason*, and when the question does not concern any thing constituted by hidden laws of external nature, but regards only certain *parcels of our thoughts*, shaped and limited by

verbal definitions, selected and approved by the rational convention of mankind, and constituted by *reason itself*.

The ultimate point of research at which Professor Stewart has left this refractory subject, is marked out by the following concluding observation, in page 130 of his "second volume:"—"Upon the whole "it appears to me, that the celebrated dispute concerning abstract "general ideas, which so long divided the schools, is now reduced "among correct thinkers to this simple question of fact, Could the "human mind without the use of signs *of one kind or another*, have "carried on general reasonings, or formed general conclusions? "Before arguing with any person on the subject, I should wish for a "categorical explanation on this preliminary point."

Now, having felt urged to hazard a speculation upon this subject, I must remark, that I cannot enter upon it with an admission that the *ground of its difficulty has been at all narrowed*, since the writings of Bishop Berkeley. As for the *external general fact*, that we reason usually upon signs alone, or without necessarily referring them to any things they may signify, it is a truth which every school boy has experienced; and it seems strange that it should demand the aid of illustration from the *algebraic* art, to enable it to be duly recognised. But, recognised it has long been: and the only question which it leaves undecided, is, *whether, in any case, we could leave out the use of words, or signs altogether*, and reason concerning *what are called general ideas, alone*.

This question, I am now to observe, may, by an allowable latitude, be answered by the Conceptualist in his own favor; whether with truth or not. For he may, from a view of his own thoughts, assert that we have an *original* capacity for reasoning upon general ideas, without signs: but that owing to the previous and invariable habit of

using language to express our thoughts, the association between the two becomes so riveted, that we are rendered incapable of breaking it ever after. This answer, if not solid, is at least specious: and what is more, the Nominalist is not, by any argument which he has yet found, provided with any *external proof* of its fallacy. The general fact which I have already noticed on the side of Nominalism, is indeed an *external evidence*, and it is a very strong *presumptive evidence;* but it *proves nothing.*

Thus, it seems vain to hope that the controversy can ever be decided by the methods of inquiry hitherto followed. And the concluding style which has been adopted upon the subject, sufficiently speaks the feeling, that philosophy should be thus confounded and foiled, where we might have expected her dictates to be the most clear and imperative.

After such results, it ought not to be upon slight consideration that any one should hope to produce a material change of prospect; and perhaps the only apology that could be offered for the attempt is, to plead that it is not made upon slight consideration. It appears to me, however, that the subject at least admits of being treated in a way entirely foreign to the methods of inquiry heretofore pursued; and I am even led to think, that the question, as it has been finally put, may be answered in the solution of the problem by altogether a decisive process. Such, at any rate, is the aim of the following speculation.

In the execution of this task, it appears requisite to present a brief previous sketch of the principal assumptions of the doctrine which is herein to be opposed. But, with this exception, I shall restrict myself principally to treat the subject upon the ground of the following consideration; namely, That there has not at any time been discovered, any test of the matter, of a nature that places, or even *pretends* to place, either of the opposite parties in this dispute, in a dilemma between *a total surrender and a manifest absurdity.*

That no such view of the subject has ever been discovered, may be manifest to the reader by the fact, that after all that has been done by philosophers with a view to its elucidation, it still remains, that *both the Nominalist and the Conceptualist* may equally prosecute all the various walks of science, without either of them finding his progress arrested by any obstacle set up by his opponent in this controversy. And thus the verbal dispute has lingered on through half a dozen centuries, *only because it has never been found liable to any such test:* while it is obvious, that were either of the doctrines in question once shown to be at variance with the indisputable principles of reasoning, in any matter of strict science; the controversy must then be *substantially* at an end, whatever might become of *verbal* difficulties. Besides this, too, my present views incline me to think that the difficulty of the subject is not materially *verbal;* but is *ideal*, and therefore *substantial as an object of thought:* and I am in hopes it will be found to vanish altogether, if the wrong doctrine can be once fairly placed under the sentence of an argument *ad absurdum.*

The thing which I herein propose to show is, that the doctrine of *Universal Conceptions* is no less than at variance with the indubitable principles both of *reasoning* and of *simple judgment*, in all the various walks of general knowledge. What I shall *ultimately* attempt to point out is, that the doctrine in question is in violation and destruction of the first principles of geometry itself: but, besides this, and previously, I shall endeavour to prove, that Conceptualism is at variance with the structure and necessary acceptation of language, in its general application to objects of every class.

If it shall be thought to augment the improbability of establishing my view upon mathematical ground, that those in general who have engaged in this controversy have been themselves geometricians, which must render it highly improbable that both the violators of the prin-

ciples of geometry and their opponents, (as *Conceptualists* and *Nominalists*,) should have equally and wholly overlooked so important a real feature in the ground of combat; I have only to suggest, that both parties were probably governed by *a certain maxim in mathematics*, which favors such an oversight; and, that if the maxim were indeed true, there would be no oversight in the case; but that I rest much upon the hope of decisively proving it fallacious. The nature and various bearings of the maxim in question, will be in part explained in the introductory view of the subject which is now immediately to follow.

VIEW OF THE STRUCTURE OF CONCEPTUALISM.

What is called GENERALISING, is the act of *ideally combining into an actual unity of object*, all the *perfectly similar attributes* which we observe dispersed in any number of separate subjects: Such is the attribute we call *circularity;* which, to sense, may appear in the sun, and in the moon, and in an innumerable variety of other subjects, both of nature and of art; all which, therefore, are popularly said to be of the "*same shape.*" This is a beneficial work, upon which we are very early set by the wise providence of our intellectual constitution. It is *a fictitious process*, which the mind imposes upon itself; induced by *convenience*, and by the *yet imperfect* discriminative power of the understanding. It may be classed with various other deceptions which nature permits for our benefit, and which it is the business of the philosopher to explain. It is the same fiction that is afterwards extended and improved into the artificial constitutions of *genera and species;* and, since the deception is found thus expedient throughout the whole course of human knowledge, it can be no matter of wonder if many philosophers have found themselves unable to break the shackles of an association so deep rooted.

To justify this view I shall here only observe, that *children and the multitude*, almost invariably, use the word "*same*," where they ought to use the word "*similar*," or "*equal*." At the same time, in the *assumptions of classification*, SIMILITUDE is IDENTITY. The original or identity of the two schemes is sufficiently manifest.

In this instance indeed, science, in its process of classification, assists, instead of detecting a fallacy of the vulgar. And we find this even gave birth, among the early philosophers, to the doctrine of *real universals*: While the *modern Conceptualist*, with less grossness, but also with less consistency, entertains universals *as things conceivable* and yet as having *no existence at all*, either in the mind or out of it. There can be little doubt, however, that the art of *arranging by similitude* was prior, and gave birth to, the supposition of the real ideas held by Plato and Pythagoras.

The just view of ARISTOTLE upon this subject (which has been called into notice by the translation of Dr. Gillies) ought not to pass unobserved here. But, while that view amounts to the *purest Nominalism;* it holds out no proofs of the absurdity of the opposite doctrine. Accordingly, it has not prevented the *second* speculation of Professor Stewart; nor has it prevented *the concluding question* of that second speculation. The same difficulty, therefore, remains yet to be solved, that was left unsolved by the founder of the school logic.

Having considered this subject until it appears divested of an extensive degree of mist and subtilty, which are thrown over it by the assumptions of general classification, and which at some points gain an additional color from the strictures of Dr. Reid, I am led to think that the doctrine of Universal Conceptions is made up of two absurd principles, which may be effectually analysed and disproved. The nature of these principles, therefore, I propose, in the first place, to state here in the express words of Dr. Reid himself. At the same

time it is proper to intimate, that although it is certainly meant that the absurdity of these principles shall appear, even in the very delineation of them: yet this is not intended as the *proofs* upon which I am to ground the refutation of that doctrine. On the contrary, I contemplate a set of proofs of a very different nature.

The passages I shall offer here from Dr. Reid, are all, I believe, to be found from page 120 to page 126, in the second volume of his "Essays on the Intellectual Powers." These contain his *elementary assumptions;* and I hope they will sufficiently vouch for the fidelity of the sketch.

First, In the operations of *abstracting* and *generalising*, as described by Dr. Reid, it is not assumed that we are ever to look any where for *attributes*, except in *some* SUBJECT *that contains them.* In several places he refers to an *individual subject*, for an instance of *abstraction:* but I shall here note only the prior instance, wherein he says,—"With regard "to abstraction, strictly so called, I can conceive nothing in it that is "difficult either to understand or practise. What can be more easy than "to distinguish the different attributes which we know to belong to a sub-"ject. In a man, for instance, to distinguish his size, his complexion, "his age, his fortune, his birth, &c."—To this question we may answer: nothing is more easy.

Secondly, But, to prevent misunderstanding, Dr. Reid in various ways marks out, that "attributes may be with perfect ease distinguished "and disjoined in our conception, which cannot be actually separated in "thought."—Now, this is a very just and necessary limitation of the process first mentioned.

Thirdly, But, along with the two foregoing principles, Dr. Reid adopts, not as a fiction, but *as an actual truth in thought*, that we perform the act of GENERALISING by "*observing one or more attributes to* "*be common to many subjects.*"

Now I must observe, that the whole issue of the matter depends upon our ascertaining rigidly, *whether the word* "COMMON," which makes so great a figure in classification, and which as such is here used by Dr. Reid, is to be understood to signify *an actual unity of object, in thought; or*, only to mean a *fictitious unity*, arising from a congregation of *similar things* in thought. And hereupon I may demand the *evidence* of its actual truth, to be produced from the two foregoing *elementary assumptions* of Dr. Reid; because these are the *only authorities to which he can appeal.* "In a man, for instance," (I ask), can "*his* size," "*his* age," "*his* birth," or "*his* fortune," be "*truly* COMMON *to many subjects?*"

That an actually-unbroken unity, of any attribute, should flow from a multitude of scattered individuals, is, I should imagine, a very plain absurdity to suppose. But if the thing does not speak for itself; the commentary of Dr. Reid must render it sufficiently manifest: for this author freely acknowledges, that he apprehends "*we may abstract without generalising:* and, upon the other hand, he equally admits, that "*we cannot generalise without some degree of abstraction.*" In short, in the outset of his scheme he has furnished complete evidence, that the fabric of a *general conception* is *a composition*, like that of a material structure; he owns, in effect, that we cannot construct any such attribute without first either *quarrying*, or *brick-making;* and, that the intellectual fabric, when it is finished, is *a thing made up of* PARTS.

After the above statement I may, perhaps, be more readily understood, when I ascribe to Conceptualism two absurdities in the two following principles.

FIRST, Instead of *only abstracting*, that is *taking a partial view* of any attribute *within* its subject; we find that the Conceptualist, when he is *in the act of generalising*, inconsistently violates his previous

assumption, and *in idea separates* the attribute from its subject, in a way analogous to the extracting of a stone from its quarry.

SECONDLY, Having thus absurdly *cut and carried his separate materials*, there is yet wanting a process of *combining them all* into one ideal mass; and here we are to mark how this may be done. We may indeed anticipate, that a structure made up of *stones and cement* can hardly present a perfect continuous appearance, in the strictest sense: but this I shall pass by, and only remark upon the cement itself; for such a thing there must be. Such a *logical cement* there IS. It is used not only in the *ordinary* constitutions of *genera and species;* but also, in a still higher sense, in the logic of *mathematics.* The thing I allude to, is that already mentioned, namely, that SIMILITUDE is IDENTITY. Dr. Reid has carried this maxim so far as to say, that "*if there be no attribute common to both, there can be no similitude.*" And he, in a like sense, asserts (page 113), that "*there is no attribute belonging to any creature of God, which may not belong to others.*"

More important matter prevents me from stopping to exhaust the different remarks which suggest on various parts of Dr. Reid's statement; and I shall, therefore, proceed to the first general observation that occurs upon this case: which is, that it may account why none of the parties in this controversy, found any thing which *they considered* as offensive to *geometry* in the *cementing process;* for it is probable they all subscribed to the maxim, that "*in mathematical quantities, equality is identity.*"

In the sequel I am in hopes of showing, that the maxim in question is not true in any sense that can support the doctrine of Conceptualism. At the same time, I do not overlook *that peculiarity in the nature of mathematical subjects*, which has given currency to the opinion, that any number of mathematical perfect equals may be held *as actually identical.*

What has thus been advanced, is all that appeared requisite for an introductory view of the subject: and we have seen that it relates entirely to *the manner of constructing* a Universal Conception.—What I have yet to advance, will regard *only the* USE *to which Universals can be put, after they* ARE *constructed.* These are two very distinct considerations. Hence then, if the reader be a Conceptualist, (no matter from what bias, nor how he makes up the account,) the remaining subject only solicits his attention to *what progress he can make* with Universal Conceptions, either in general knowledge, or in the science of geometry.

GENERAL ARGUMENTS AGAINST CONCEPTUALISM.

The most prominent objections which have struck me, as furnishing a test of the fallacy of the doctrine of Universal Conceptions, and which constitute an argument over and above the foregoing objections against their *structure*, are the two following, viz.

FIRST, EQUAL SEVERAL UNIVERSALS *are impossible in Conception.* If, therefore, it shall be proved that we *can* conceive any plurality of objects, comprehended under one same definition and expressed by the same general term; in every instance of this fact, it amounts to a rigid proof, *ad absurdum*, against the doctrine of Universals: For, *by virtue of the* DEFINITION, the objects in question must be *conceived as* EQUALS; and, to suppose *any number or plurality of* EQUAL UNIVERSALS must incur the pains of a manifest absurdity.

SECONDLY, It is impossible that the *definition* of any *species* should comprehend *every attribute* of *its individuals.* If, therefore, it appear that there is, within the range of our thought, any class of objects which, in our apprehension of them, *are perfectly equal individual*

wholes; it must follow that the definition of the *species* is also the definition of *every one of its individuals;* and, therefore, it must be absurd to ascribe *Universality* to the objects of such a definition. —But, such objects there are; as will appear.

It has already been hinted, that it seems requisite to consider the subject upon two distinct grounds; namely—*first*, upon the ground of *classification in general;* and, *secondly*, upon *mathematical ground especially.*

THE ARGUMENT AGAINST CONCEPTUALISM FROM THE PRINCIPLES OF CLASSIFICATION IN GENERAL.

The very arguments and language which Dr. Reid adopts to establish Conceptualism; are what I would select to prove its absurdity. In page 102, of his book from which I now quote, he says, that "*Every substantive that has a plural number, is a general word; for "no proper name can have a plural number.*" This is true; and, at the same time, it is a truth which embraces all the appellatives of language. But it proves the very opposite of *Universal Conceptions;* for it amounts to this, that *every appellative plurally expressed* is an expression of *number;* and number is the opposite of universality, since this last essentially implies *unity.*

There is another view, in which the above argument of Dr. Reid proves the absurdity of the cause it is given to support. One part of it is, that "*no proper name can have a plural number.*" This is evident; and the reason is, that a proper name denotes *an individual.* But this author seems to have overlooked, that *a* UNIVERSAL *is an individual*, and cannot be conceived but as an individual: therefore, *if it were true* that we could conceive a Universal, it must be impossible to conceive it in the *plural number:* and the constant use of *numerals*

with abstract terms; and the *plural formations of general words;* all prove that we cannot conceive *sole universals* as the objects of these terms. This argument I shall endeavour to illustrate by a farther test; but, previously, it may be proper to consider the broad principle of NUMBER.

Number can be conceived *only of things that are in the same class*, that is of things that are *nominally of the same attribute*, or *combination of attributes*. Yet, number is *discrete quantity;* and its very notion consists in an *ideal severalty of objects.*

It has been duly recognised by Professor Stewart, in beginning to treat of "*Abstraction,*" that "Before we can consider different objects "as forming a multitude, it is necessary that we should be able to "apply to all of them one common name." This fact he illustrates by a variety of instances; and then concludes thus:—"Whatever be the "principle on which my classification proceeds, it is evident that the "objects numbered together must be considered in those respects only "in which they agree with each other." This account of the *principle* and *origin* of our conception of number, is recognised by Aristotle; and it is undoubtedly just. It is, at the same time, a fact which appears so capable of being applied, and followed out to a decisive argument against the doctrine of Universals, that I am surprised to find it *only merely mentioned* and then passed by, and not even mentioned at all *in the controversy against Conceptualism.* But it will appear in the sequel, that, in order to constitute such an argument, there are several important considerations involved, which must be brought into discussion.

The *general* bearing of the principle of number upon the scheme of Conceptualism, must be evident whenever the two are compared; but there are *some special considerations*, which I deem it important to treat. As the basis of all; I observe, that *all objects are*

numbered in their general name: we say, "a number of *things;*" "a number of *animals;*" "a number of *men.*" Thus, all objects are *distinguished in their similar attributes*, and not in their dissimilar ones. So true is this fact, that classing and numbering are near being convertible terms. If there be no class, there can be no number; if no number, then no class. Classing is numbering, without keeping the *sum* of that number.

One of two consequences must follow from this vast consideration of number; namely, either *Universals* must be a fiction in thought; or else, *Number* must be a fiction and a thing utterly *impossible in Conception.* Which of these two is a fallacy, is a question upon which it is not probable that the learned will divide: But, if any person be found sceptical enough to doubt whether we can conceive *similar objects in severalty*, I think there may be a remedy even for a disease of this extent. For this purpose, I would suggest the following easy means of effecting a sort of *analysis* of abstract general terms.

First, Let me remark, that in the several illustrations which are offered by Dr. Reid in support of Conceptualism, he always chooses *an object signified in the* SINGULAR *number.* Thus, he says, "a *man, for instance.*" And, on other occasions, he selects the instances of "*a triangle,*" "*a circle,*" "*a line,*" "*a point,*" *and so on.* Now, all these instances appear to me to betray a self-deception of their author; and the moment we put the terms in the *plural form*, the absurdity becomes evident if our attention be awake upon it.

Secondly, But, quite besides the *ordinary or simple expression* of plural abstract terms; there are forms of speech, which occur every moment, and which, in a different and strictly critical manner, *demonstrate the severalty of the objects in our thought.* This test, I am to observe, is to be found in all such abstract terms as express any *mutual*

action, or *any equal correlation*, as being maintained by two or more objects.

We say, "as *intimate* as brothers;"—"two *contending* parties;—"fellow creatures should *assist each other*;"—"three *to* one *are odds*;" "—love and hatred are often *mutual between their objects*;"—"a *transaction between* man and man:"—All these, and an endless variety of such expressions, directly signify a *mutual action* going on between the abstract objects; and this becomes a rigid test of the severalty of these objects, in our thought.

This fact being in such a way substantiated; let us now apply to it the doctrine of Universal Conceptions, and mark the result. For instance, if "*man*" be taken for a universal object; then, how are we possibly to conceive "*a transaction between man and man?*" ABSTRACT MAN is to be found *only in his* DEFINITION: we cannot seek him *in time*, nor *in place*; nor can we distinguish him, from his fellow, by *any imagined look, or circumstance*. But, when we resort to the DEFINITION, we find *it admits no plural*, but confounds *all men into one man*, by an assumed identity. It is therefore simply manifest that, if "*man*" be referred to a UNIVERSAL CONCEPTION, it is impossible to conceive "*a transaction between man and man*;" because it is impossible to conceive the severalty of the subjects concerned.

In order to furnish the reader with a proof of this from the words of Dr. Reid himself, I here present the following passage. In page 119 he says, "Every triangle that really exists, must have a certain length "of sides and measure of angles. But the definition of a triangle "includes neither existence, nor any of those attributes; and there-"fore they are not included in the conception of a triangle, which "cannot be accurate if it comprehend more than the definition." Now this doctrine is general; and it must apply to the abstract term

"*man*," as well as to the abstract term "*triangle*:" It is therefore plain, that when the Conceptualist has to construe any abstract term which signifies *a mutual action between two men*, he has neither land-mark nor light to find his objects, *except in the* DEFINITION *alone*; which presents him with *abstract man, devoid of every distinguishing mark of plurality.*

It is *always* to be remembered that A DEFINITION operates like *a dream*, by excluding all knowledge except the image immediately presented by itself: and this image is SOLE; it never admits the conception of its plural.—The man, therefore, who imprisons his conception in *definitions*, is cut off from *numbers*; and, in rigour of truth, all his reasonings regard *only individuals of a certain nature.*

In cases of this kind, we are to observe, the NOMINALIST acts *no absurdity*: because he refers the abstract terms *to any two concrete men, either real or imagined.* But the CONCEPTUALIST has cut himself off from any such resource; and he must confine himself to his DEFINITION, with all the absurdity which it involves. If he once quit that ground, and resort to *time*, to *place*, or to *circumstance*, to make out "a transaction between man and man;" he thereby stamps his *men for individuals*, and he is then *no longer a Conceptualist.*

The present argument closes here: although it might be extended to other considerations. The *Second Argument*; namely, that furnished by *our apprehension of* EQUAL WHOLES, ought now to follow; but, as it involves an extensive discussion when it is *treated with regard to the world of* EXTERNAL CONCRETES, I shall not enter upon it, except in so far as it regards the objects of GEOMETRY.—It remains then, only, to proceed to both the enumerated arguments upon mathematical ground.

THE ARGUMENT AGAINST UNIVERSAL CONCEPTIONS FROM THE PRINCIPLES OF GEOMETRY.

The general fact which it is requisite I should establish, for the present purpose, is, that we *can actually conceive a plurality of equals in geometry.*

The attempt before me will, I am sensible, be by some prejudged for a forlorn hope; especially considering the *extent* to which it is requisite I should establish it. The subject has recently engaged the attention of Professor Stewart; who, indeed, has denied the truth of the maxim in question, *in so far* as regards those equals which are at the *same time dissimilar in the mode of their ideal existence,* such as *a triangle equal in area to a circle.* But I do not find that he goes farther than this, or holds out any opposition to the *assumed actual identity* of those equals which are *also similar without any ideal transposition of parts,* such as *the two mathematical triangles meant for our conception in the fourth proposition of Euclid's first book.* Indeed, had not this doctrine, of the *actual identity* of such equals, governed both Dr. Reid and his opponents, alike, it is not easy to conjecture which way they all overlooked, how manifestly the supposition of UNIVERSALS is exploded by the contemplation of *any two equals in geometry.* And, as Professor Stewart has gone so largely into the controversy without noticing any offence to Mathematics in the doctrine of Conceptualism, which he has therein opposed, I am left to suppose that he admits the *actual identity* of such equals as form the basis of my present argument.

It is now to be stated, that the assumption of the identity of equals in geometry, is built wholly upon *another assumption;* namely, that RELATIVE PLACE *and* POSITION *are not to be brought into account.*

It appears, therefore, that it is this last mentioned assumption that ultimately and in fact I am with logical strictness to refute: and it seems of consequence to note here, in the words of Professor Stewart, the extent to which the superstructed maxim is carried in these modern times.

" It was probably with a view to the establishment of this doctrine, " that some foreign elementary writers, have lately given the name of " identical triangles to such as agree with each other in sides, in angles, " and in area. The differences which may exist between them in re- " spect of place and of relative position, (differences which do not at " all enter into the reasonings of the geometer) seem to have been " considered as of so little account in discriminating them as separate " objects of thought, that it has been concluded they only form *one* " *and the same triangle*, in the contemplation of the logician."

In this passage it would seem, that its author does not altogether assent to this degree of identification: And the value of his expression is highly important here; since it is precisely upon *discriminating geometrical equals*, " *as separate objects of thought in the contemplation of the logician*," that I am to build the following argument against Universals. Now, therefore, I desire to remark, that it cannot in the least save the doctrine of Universal Conceptions, although it be granted that to *any extent* the considerations of place and position MAY *be* left out of the *reasonings* of the geometer; unless it could be farther proved that they MUST be excluded from his *reasonings*, and from his CONCEPTION *also*; and that, too, *in every possible instance*. For, if it shall appear that, in any one instance in the whole scope of geometry, we CAN CONCEIVE two, or more *similar equals, distinct from one another*; this one instance must utterly explode the supposition of their being *Universals*.

To decide this matter, therefore, let me now venture to submit, that I think the elements of geometry present a great variety of instances, of EQUALS *in which the differences between them in respect of relative*

place and position CANNOT *be excluded from conception.* Two or three of these instances it is fit I should cite here; which I trust will prove sufficient for the purpose. But, previously to risking my own view of the subject, let me remark that it is altogether supported by an authority of no light weight. In all that has been said upon this subject by the learned *Dr. Barrow*, in his "Mathematical Lectures," I think there is not one word that lends any assent to the *actual identity of any sort of equals:* But the general bent of his discourses is very strongly to inculcate the contrary; especially in his *Thirteenth* lecture, to which I desire to refer the reader.—In one passage he expressly says, that "*the Eighth Axiom* can either be no way, or else every way, convertible; no way, if what is there accounted *congruity* design *actual congruity;* every way, if it be only taken for *potential*, i. e. *those things* which *are capable* of congruity are equal and convertible."—He is farther very full on the same side: but I have not room to derive more aid from quoting him in this place.

The instances I am going to cite, are indeed of a nature which goes *even beyond* what my argument requires, and equally beyond what seems to be asserted by *Dr. Barrow:* for they exclude not only the conception of *actual identity*, but, I think, they *do not admit so much as a potential identity*, so long as they are viewed agreeably with their definitions.

FIRST, It appears to me, that we cannot affirm *so much as the potential identity* of the *four equal sides of a square:* Because, these equals not only *must* be conceived in *four distinct relative places and positions;* but we *cannot afterwards* conceive them "*capable*" of being moved into actual congruity, without their *ceasing to be* what they are *defined*, namely, *the four sides of a square.*

But, if it *were* so, that *a potential identity* of the four sides of a square *could* be conceived; this would not at all help the cause of Universals: for it is *an actual identification* of the four sides of a square, that alone could save that cause. Now, therefore, the Con-

ceptualist must either affirm that *a square is a figure actually bounded by* ONE *straight line containing four right angles:* Or, else, if he will not go the whole of this length, he must, (as the only alternative,) maintain that *a square is a figure bounded by* FOUR EQUAL UNIVERSALS; which last is an absurdity highly decisive of the controversy.

Here, if any person for a moment suppose, that, in taking the PARTS *of geometrical wholes* for my illustration, I have outstepped the *meaning of Conceptualism*, or the meaning of *Dr. Reid;* In other words, if it be thought that the defined *parts* of wholes, are not esteemed *as much Universals* as the wholes to which they belong; let the reader observe the language of Dr. Reid himself upon this subject.

In the "Essays on the Intellectual Powers," Essay 1. Chap. 2d, he says,—"*Thus I think it appears to be evident, that we have general con-* "*ceptions that are clear and distinct, both of attributes of things, and of* "*genera and species of things.*"—And again, in Chap. 4, he says, "As "by an intellectual analysis of objects, we form general conceptions "of single attributes, so by combining several of these into one parcel, "and giving a name to that combination, we form general conceptions "that may be very complex, and at the same time very distinct. "*Thus one who, by analysing extended objects, has got the simple notions* "*of a point, a line, an angle, a surface, a solid, can easily conceive a* "*plane surface terminated by four equal straight lines meeting in four* "*points at right angles. To this species of figure he gives the name of* "*a square.*"

Now, in the above passages, as in many others of his writings, Dr. Reid is most laudably explicit: and herein he has asserted nothing but what the doctrine of CONCEPTUALISM *absolutely demands of him.* I trust, therefore, it is evident that I have not strained that doctrine. And I have equally to hope, that the glaring absurdity it exhibits when applied to "*four equal straight lines meeting in four points at*

"*right angles*," *(or to any other such combination of equals,)* must be admitted for a decisive argument against it. Nothing, indeed, but the strength of prejudice, and the inveteracy of opinion induced by such a length of controversy, could render farther illustration at all requisite. But, out of regard to these considerations, I shall cite two or three instances of *geometrical equals, considered as separate wholes.*

SECONDLY, then, *Mathematical Points* are defined wholes: and they are all equals by the necessity of their definition. Yet, a straight line is defined to be, "that which lies evenly *between* its extreme *points*." Now, it is sufficient for my present purpose to observe, that the *separate existence and relative position* of the extreme points, *must enter into the* CONCEPTION of the geometer, if not indeed into his *reasoning*.

Moreover, the very *postulates* of geometry *forbid so much as a potential identity of Mathematical Points*. The *first* postulate grants that, "a straight line may be drawn from any one point to any other point." Now, therefore, *so long as we conceive this postulate*, we cannot *at the same time* conceive *a* "*capability*" of the ideal *motion*, or of the ideal *congruity*, of the *two points* in question; and yet, they must be conceived as perfect equals, and as separate defined wholes.

THIRDLY, *Parallel Lines* present, perhaps, a still more *striking* instance of the necessity we are under to conceive geometrical *equals as separate*. These disunited wholes must *cease to claim the definition of parallel lines* before we can conceive so much as their *potential* identity; for *distance* and *position* are the very bonds of their essence.

It has already been observed, that the present argument against Universals has only to do with proving that *relative place and position* enter the *conception* of the geometer, and it has *no necessary concern* with what is more strictly called his "*reasoning*." But we are to observe, that in the instance of *parallel lines, place and position* cannot be left out of the *reasoning* of the geometer: For, the demonstra-

tion of their *parallelism* consists in showing their *position*, by proving that they *must continue separate*.

In fine; it appears that PARALLELISM furnishes the most striking means of settling the true distinction between *equality* and *identity*, in all those cases wherein there has existed any doubt or division in opinion upon this point. For, as by the supposed *coincidence* of two parallel lines, their *parallelism* must cease; so, upon the supposed coincidence of two triangles, their *equality* must cease: and as we cannot affirm the identity of *two parallel lines;* so, by parity of reasoning, we cannot affirm the identity of *two equal triangles*. The only difference between the two cases is, that in one of them a *separation is expressly* provided by the terms; while in the other case it is *only implied*, and *imperatively demanded by the understanding*. But, if this parity be not amply manifest; then, I presume, we may conceive two or more *equal and* PARALLEL SURFACES, as *easily* as *parallel lines:* And I suppose that we cannot, at any rate, affirm *the identity of* TWO EQUAL AND PARALLEL *triangles*. But, the supposition of TWO *equal and parallel* UNIVERSAL *triangles* is an absurdity: Which rigidly proves that all such equals are INDIVIDUAL OBJECTS, and ONLY *individual objects*.

The instances which have thus far been enumerated, appear to speak for themselves too decisively to require any addition: and the application of them must be obvious, in exploding every supposition of UNIVERSAL CONCEPTIONS. I shall therefore proceed to consider the only other argument intended for discussion in this paper.

THE SECOND ARGUMENT AGAINST CONCEPTUALISM, AGREEABLY WITH THE FIRST ENUMERATION.

It was at first assumed, that there are TWO most general arguments herein contemplated against the doctrine of Universal Conceptions. The SECOND of these arguments (as stated in page 11) consists in this;

that in those subjects that are equal WHOLES by their definition, the supposition of their being Universals involves this additional absurdity, that the SPECIES *and its* INDIVIDUALS *must be* WHOLLY *embraced by* ONE SAME DEFINITION.

Of such a sort of equals we have a striking instance in *Mathematical Points*. In mathematical points there is *no variety, either in quantity* or *quality:* they are all, in the most perfect sense, equals by the necessity of their definition. If then a mathematical point be a *species;* I would ask, what are the *individuals* of this species?

To ascertain this; let us lay aside that it is *previously* assumed by Dr. Reid, that "*In all the fifteen books of Euclid's Elements, there is not one word that is not general.*" I say, let this be laid aside; *because*, when a logician has assumed that a point is a SPECIES, I suppose *he must*, (when called upon) assign to this species INDIVIDUALS *of some sort;* or else, confess an absurdity in his assumption.—The only possible answer then is, that the *individual* is but EQUAL, in *all its attributes*, to the SPECIES; the *latter not having fewer attributes, nor the former a greater number.* Now, this is a manifest absurdity *if* A SPECIES *be supposed* ANY OBJECT *of thought* other than a *mere* NAME *of a collection of individuals.*

In this case, we observe, the NOMINALIST *is at no loss.* For, HE holds the word "SPECIES" for *a mere* NAME *of a collection:* and he distinguishes each individual point in this collection *by its own peculiar relative place or position.* But the Conceptualist has cut himself off from this recourse: And, even if he *would* avail himself of it, *a difference in place is not a specific* but only a *numeric difference;* which, the moment it is recognised, stamps the object for *an individual* and *decides the controversy.*

This occasion shows, that it is *utterly absurd* for any NOMINALIST to think of *excluding* PLACE *or* POSITION from his consideration, because, *without separate marks of position* he can *no more conceive* A PLURALITY *of individual points*, than the CONCEPTUALIST *who con-*

founds all points into one, by shutting them up into an assumed *actual identity*.—NOMINALISM, *therefore, cannot stand if* PLACE *be taken away.*

This instance exhibits the PRINCIPLE of the "*Second Argument:*" And I apprehend *its latitude of application is very extensive.* For I suppose *the whole science of geometry to depend upon our capability to conceive mathematical points, distinct and* SEPARATE *from one another.*

It may be of service to note, here, how singularly *mathematical points* are fitted to place the absurdity of the doctrine of Universals in a striking light. When a reader is told in the words of *Dr. Reid*, that "*a triangle is not an individual; it is a species,*" it may immediately occur to him that there are *many varieties of* TRIANGLES, and his passing mind *may vaguely accept these*, as the supposed *lesser species* of the *great species* or *genus, triangle.* Thus although, *if followed up*, he would certainly find the assumption end in absurdity; yet the absurdity probably will on this occasion remain beyond his momentary view. —But, when it is said that "*a mathematical* POINT *is not an individual*, but a *species;*" no person can be so heedless as not to ask himself *what and where are the* INDIVIDUALS *of this species*: and thus the whole front of the absurdity stands revealed.

To conclude; The necessity there is to conceive *mathematical points as* DEFINED SEPARATE EQUAL WHOLES, is a truth of such extensive and general operation in geometry, as to render this particular object an evidence most striking, and of itself conclusive of the absurdity of supposing these points to be *Universals.* For, if any one mathematical point be supposed a Universal, this manifestly *precludes the possibility of conceiving* ANOTHER SUCH: and thus the science of geometry must *end* where it *begins;* namely, at *a mathematical point.*

THE END.

ON THE

AXIOMATICAL LAWS OF VISION.

PREFACE.

THE most proper preface to the following subject, on the present occasion, appears to be that of introducing *the fact asserted by* PROCLUS, which has already been alluded to in the address prefixed to this publication. In stating this fact, however, it may be of no small consequence to note, very particularly, that although its truth must attest the truth of the Laws of Vision, (which is my reason for bringing it forward here) yet if the fact could be actually disproved, this could not at all affect these Laws, since they do *not depend upon*, but *include*, the fact asserted by Proclus. Yet, nevertheless, I must add, that I believe myself to have distinctly proved the fact in question; which, it is to be remarked, is NOT PROVED *by Proclus*, but *only asserted* by him.

In Mr. Taylor's translation of the "*Commentaries of Proclus on the first book of Euclid's Elements*," Vol. I. page 125, is this passage, "We should admit the followers of Apollonius, who say, that we "obtain the notion of a line when we are ordered to measure the *lengths* "*alone*, either of ways or walls; for then we do not subjoin either "breadth or bulk, but only make one distance the object of our consi- "deration. But a line may become the object of our sensation, if we "behold the divisions of *lucid places* from those which *are dark*, or "survey the moon when dichotomised; for this medium has no distance "with respect to latitude, but is endued with longitude, which is ex- "tended together with the light and shadow."

The perspicuity of the *description* of this fact, is highly conclusive and valuable. But I cannot avoid remarking, how strange it appears that any philosopher who had adverted to this fact in the PARTICULAR *instances of* "*the divisions of* LUCID PLACES *from those which* ARE DARK," should not have intuitively discerned that the *principle* is GENERAL, UNIVERSAL, AND SOLE: which it must be, since LIGHT *and contiguous* SHADOW, produce in us TWO SENSATIONS OF COLORS *with* A LINE BETWEEN *them*, just as is, and MUST *be* done by ANY

OTHER *two colors whatever.*—His not discerning the UNIVERSALITY of the fact was the only thing that could have kept Proclus from advancing on, to discern the *Four Laws of Vision* and their *axiomatical nature*, together with their *direct consequences.*

OF THE EXTERNAL CAUSE OF VISION.

1. DISTANT BODIES *are* NOT, *by any medium, the* GENERIC *cause* of Vision; since *sensations of* COLORS, *accompanied by* FIGURES, are as *constantly*, and as *variously*, excited by experiments of pressure upon the eye, and by other bodily affections, as they are by LIGHT *reflected from* DISTANT OBJECTS.

This general fact, being duly recognised, ascertains of itself the *independence* of Vision upon external DISTANT *bodies*, and removes a very great and most pernicious stumbling block, which has strangely been suffered to remain, an obstacle to all advancement, although uniform experience has long demanded its expulsion from the subject.

2. When the optic organ is stimulated, either by light, by sensible pressure, by certain bodily diseases, or by any other such impulse, the mind undergoes a set of SENSATIONS *called colors.* Such are those beautiful *phantoms* that appear to us when we look at a rainbow, or a landscape. These phenomena *seem* to adhere to external distant objects, like a skin cast over them: but there is no fact upon which philosophers are more unanimous, than that they are nothing but our own SENSATIONS. It is therefore here assumed, AS A FIRST PRINCIPLE, *by universal consent*, that PHANTOMS OF COLOR *are but* "A SPECIES OF THOUGHT."

3. With this *only settled principle*, it has ever been one of the greatest problems in philosophy to discover the NATURE *and* PLACE of those *outlines*, that are seen as it were *surrounding the phantoms of colors*, and to which we give the appellation of VISIBLE FIGURE.—There now exist only two opinions concerning this matter: Perceived figures are either the real identical forms of external and distant bodies; or, they are actually the forms of our own sensations, which, if so, do not SHOW, *but only* INDICATE, *some* UNKNOWN EXTERNAL *cause.* The highest authorities of the last century have divided upon this point: and the

literary public, impressed by the untoward character of the schism, appear to consider all proof, or foundation on the subject, as a desideratum utterly hopeless. Such is the discouraging introduction to the following principles.

OF THE POSSIBLE CASES OF VISION.

All the possible cases, or accidents, of Primary Vision fall under FOUR *general Facts, or Laws.*

Each of these *Four Laws*, is *also an* AXIOM: Its truth does not depend upon the *laws of* NATURE, but on the *law of* THOUGHT; since, the moment it is apprehended, we discern that its *contrary is impossible.* This forms the most striking and important character of the Phenomena of Vision.

Two of the Laws of Vision are UNFORMATIVE, either of any *figure*, or of any *element of figure.*

The other two Laws are FORMATIVE, either of some figure, or of some element of figure.

FIRST LAW.—UNFORMATIVE.

Prop. No one uniform sensation of color can ever be accompanied by a perception of any visible figure, any line, or any point.

Inst. If the eye traverse the unclouded heaven, or if it skim the surface of the sea, we shall undergo *a uniform* SENSATION OF ONE COLOR; and here it is *self-evidently impossible* we should ever perceive any visible figure, any line, or any point, so long as the sight keep within the field of this one color.

It is plainly as impossible to conceive a visible line, without calling up *some* SECOND *color*, as it is to conceive a boundary to an infinite surface: For, any color we perceive, must be *absolutely without end*, if it be not terminated by our view of *some* SECOND *color.*

SECOND LAW.—FORMATIVE.

Prop. When any two *unblended* sensations of colors are felt at the same time, they MUST MEET *by their nearest edges*, and this MEETING we must perceive *as* A LINE.

Inst. If the eye traverse either the firmament, or the ocean, until it arrive at, *and take in*, ANY SECOND *color;* the evidence we have for this fact can be no other than *our being conscious* WHERE ONE sensation of color ENDS, *because the* OTHER BEGINS. This MEETING of the two sensations of colors, is A LINE *of* CONTRAST and *of* CONTIGUITY *in our view:* and a perceived line, therefore, is purely nothing but A THOUGHT OF DISCRIMINATION, which we make between two of our own sensations. At the same time it is plain, that we can *no more avoid perceiving the* CONTRAST, *and the* EXTENDED DIRECTION OF THIS CONTRAST, than we can avoid being conscious of the *two different sensations of colors which form this contrast.*

THIRD LAW.—FORMATIVE.

Prop. When any two unblended sensations of colors are felt at the same time, and are so disposed as that one of them *embraces or surrounds* the other, we must perceive a line of junction, which is where the embraced sensation meets that which embraces it. Such a line must *return into itself;* and thus is formed *every complete figure* that the visive faculty can *strictly apprehend.*

Inst. When we look at the Moon, surrounded by the azure sky, we suffer a SENSATION OF SILVER WHITE, *embraced by* A SENSATION OF AZURE, and the line perceived between these two sensations *returns circularly into itself;* which, people *take* for the circle of the Moon.

It must be an obvious truth (although it is overlooked by PROCLUS) that, WHATEVER *be the* HUES OR TINTS *of the two sensations employed,* there can be but ONE UNIVERSAL PRINCIPLE that gives any perception of a LINE BETWEEN *them;* and this principle is A PERCEPTION OF CONTRAST.

FOURTH LAW.—UNFORMATIVE.

Prop. When any two sensations of colors are felt at once, and are *blended* or *softened* at their nearest edges, they never can be perceived as forming *any* LINE between them, not, even, if their distant parts be of the most opposite colors.

Inst. Let any surface be conceived to be *black* all round its edge, and *white* in its centre, and let the two colors run gradually into each other: No line can ever be perceived from looking within the field of this surface.

Innumerable other instances of this fact may be had, as when we look at waving corn, or shot silks, spheres, mirrors, or drinking glasses.

This Fourth Law strikingly illustrates the other three; because herein we suffer TWO *sensations of colors with* A NEGATION *of all* FIGURE, OR LINE, between them; and here, therefore, we are, *by a* NEW RESULT, more *vividly* (though not more certainly) *convinced* that it is NOT COLOR, BUT CONTRAST *that is the* CREATIVE PRINCIPLE *of any perceived* VISIBLE FIGURE, OR LINE.

To conclude. Visible figure is *a* POSITIVE *thing to* OUR VIEW, but *only a* RELATIVE *thing* in regard to the TWO SENSATIONS OF COLORS which combine to give it being: it is nothing but the LOCAL OR CO-EXTENDED RELATION of one sensation to the other.—To say, therefore, that we perceive visible figure, is to say that we perceive the co-local or co-extended relation which one sensation of color bears to another one, felt at the same time.

It follows, upon the highest KIND *of evidence, that visible* FIGURE *is nothing but* A CREATURE OF THE PERCIPIENT,—A THOUGHT OF THE MIND,—*yet, a thought resulting from the action of* SOME EXTERNAL CAUSE, stimulating our visive constitution.

THE LAWS OF VISION ARE MATHEMATICAL AXIOMS.

The four General Facts of Vision are herein called only *Laws*, because their subjects are, in the first place, sensible or natural phenomena. But it must be insisted upon that they possess a far higher title, in being MATHEMATICAL AXIOMS.

What renders this consideration most important, is, that even could it be proved that visible lines are not mathematical as to the property of being *void of breadth*, this (as has been already remarked) would not hinder the laws of vision from being mathematical AXIOMS IN THE CLASS *of their evidence*, the SELF-EVIDENT NECESSITY *of their truth*.

Physical laws (it is agreed) *are not necessary, in our conception :* they rule what IS; but, may not rule what SHALL BE: Light may fail to excite sensations of colors in the human mind; and sensations of colors may, for aught we know, be excited in minds without eyes: all this is *conceivably* possible. But, to conceive any ONE *sensation of color with a boundary or* LINE *to it;* or, to conceive any TWO *sensations of colors at once* WITHOUT A LINE *between them,* is an impossibility of the *very* SAME CLASS, as to conceive an infinite surface with a limit, or TWO contiguous mathematical surfaces without the line that *makes them* TWO.

Now this PERCEIVED NECESSITY of the Laws of Vision, is a paramount test that a visible line is not an external thing; because, it is *not merely an object of* SENSE, *but is also an object of* INTUITION; —it is not merely a thing that NOW is, but a thing that EVER MUST BE, *if its* CO-EFFICIENTS *exist.* Every EXTERNAL *object* is a thing that *may not be* at any future time; and, while it exists, we *know not its co-efficients :* but, we *absolutely know* the *co-efficients* of a visible line, by the *same* process of RATIONALITY, and to the *same* PERFECTION, that we know that *the co-efficients of* ANY IDEA OF RELATION *must be* SOME TWO THINGS, BETWEEN WHICH the *mind perceives this relation.* Here I must refer to the small tract I published some time ago upon "NECESSARY CONNECTION;" in which my object is to show that we *absolutely know the* CO-EFFICIENCY *of* ALL OUR IDEAS OF RELATION; and in which I suppose the thing is rigidly proved. Now SENSATIONS OF COLORS ARE IDEAS; and I repeat it here, that we have the *same degree of cognizance of* THEIR RELATIONS (one to another) that we have of the relations of *equal, double, or half,* between any two mathematical quantities, that is *we perceive the* NECESSITY OF THE RELATION *so long as the* TWO SUBJECTS *exist,* and we intuitively perceive that the relation cannot exist unless its two subjects exist.

What a change in the *assumptions of mathematics,* to find, that its conclusions are NOT *limited to hypothetical or conditional truth,* but embrace *also* FACTS,—CONCRETE FACTS! *What an enlargement of the field of demonstrable subjects!*

VISIBLE LINES ARE VOID OF BREADTH.

This general fact (it is always to be remembered) is *wholly subordinate* to the Laws of Vision, being *included* in those laws but not necessary to their truth. At the same time, however, it is a fact rigidly demonstrable.

A mathematical line (*of the* SCHOOLS) is *demonstrated* to be void of breadth, in consequence of its being *defined* to be "*the common boundary of two contiguous surfaces.*" Now, if one of the two surfaces be supposed *blue*, and the other one *yellow*, it is plain the *mathematical line of contiguity*, and the *line of contrast of the two colors*, *is* ONE SAME LINE; and since it has no breadth as the common boundary between the two *surfaces*, it can have no breadth as the common boundary between the two *sensations of colors*.

To attempt to invalidate this upon the ground of the *imperfection of sense*, would only prove that the person who undertakes it does not apprehend ALL *the terms of the subject*. The *subject is* A LINE *that* WE SEE: And, (without any appeal to the suffrage of PROCLUS) we may safely maintain that *we* DON'T SEE *what we* DON'T SEE. The imperfection of sense only makes us NOT SEE *breadth*, in some instances where breadth really is before us, and where a magnifying power makes it evident: But the imperfection of sense cannot make us *see breadth* when it *makes us* NOT SEE *it*. *In rigid truth*, therefore, *the* IMPERFECTION of the organic process of sense, *causes the* PERFECTION *of the mathematical line we* SEE; for the organ *will not convey a report of breadth to the* SENTIENT, in some cases wherein the EXTERNAL *object that we look at really has some minute breadth*.

A visible line cannot be of any *one color*; because it is proved *(by the First Law)* that *no one color* ever can have a *line*. If then a visible line have any color, it must be a part of each of two contiguous colors: but this would show a DOUBLE LINE to every object, which we know to be a result utterly contradicted by the fact.—Moreover, if any such double or two lines be supposed, it is plain that each one is but *a rim of its own* SURFACE; and *what is* SURFACE *cannot be* LINE; neither

can two contiguous sensations of colors APPEAR to us as forming a LINE *until we mark the* PEACE *where* BOTH COLORS CEASE TO BE, *by reason of their coming in* CONTACT.

It is true that we see instances enough of breadth in what are called softened lines, or where two colors blend: But none of these are visible *lines;* they are all visible SURFACES, and they must *be stript of the appellation of* LINES, in an inquiry like the present.—Visible lines are all those lines which are *void of breadth to the* NAKED EYE, *and which can farther attest* that they are breadthless to the naked eye, *by showing no breadth when subjected to a* MAGNIFYING POWER.—Such lines are raised in our sentient by our looking at the letters of good printing, as divided from the white field of the paper: and such, too, are seen from looking at most other objects.

It is here an obvious *truth*, that *a visible line which shows no breadth under a magnifying power, can have no breadth to the* NAKED EYE. It is therefore vain to try to overturn the fact, even if we could by the strongest power produce any evidence of breadth: for it must still remain, that the NATURAL EYE of man enables him to see NO LINES, *but lines that are* VOID OF BREADTH IN HIS APPREHENSION OF THEM.

Finally; But if, in the face of experiment and of common sense, any person choose to assert *that* A VISIBLE LINE HAS INVISIBLE BREADTH; then, (I repeat it here) this *absurd contradiction in terms*, if suffered to stand for an objection, could be of *no concern to the* LAWS OF VISION; for these Laws must still be AXIOMS, and A VISIBLE LINE *must still be nothing but* A LINE OF CONTRAST BETWEEN TWO SENSATIONS: And the CONTRAST LINE *must still, and for ever, be where the* SENSATIONS ARE *which form it, which is* IN THE MIND ITSELF.

HEREUPON, (urged by the moment of the evidence, and by the infinite magnitude of the consequence,) I make the appeal, in this one question,—Will it *(against the* FOUR AXIOMS OF VISION) be ever affirmed, that VISIBLE FIGURES *are the* DISTANT THINGS OF AN EXTERNAL WORLD? Or, will it be ever affirmed that Visible Figure is not a phenomenon of the mind?—*This is an appeal that* CANNOT DIE.

THE END.